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**From:** Ruthann Rudel [rudel@silentspring.org]  
**Sent:** 1/28/2019 6:41:15 PM  
**To:** Mark Strynar [Ex. 6 Personal Privacy (PP)]  
**CC:** Katie Boronow [boronow@silentspring.org]; Laurel Schaidler [schaidler@silentspring.org]; Strynar, Mark [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5a9910d5b38e471497bd875fd329a20a-Strynar, Mark]  
**Subject:** Re: Could any of these chemicals be precursors to PFHxS?

Thanks Mark! We're glad you are back at work.  
We really appreciate your help. I think we have some follow up testing work getting underway and will let you know if we learn anything especially interesting.  
I'm not sure how OECD came up with that list of ~ 130 chemicals associated with PTFE . . . .  
-Ruthann

Ruthann Rudel  
Director of Research  
Silent Spring Institute  
*Leading environmental health research to identify opportunities for prevention*  
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On Mon, Jan 28, 2019 at 12:09 PM Mark Strynar [Ex. 6 Personal Privacy (PP)] wrote:  
Ruthann,

Good to be back at work. I had a chance to look at these with some resources I only have at work at EPA. The short answer is of those I could find structures for none will turn into PFHxS. I still could not get structures for three. However I did note some of these are used to make Nafion which is a co-polymer made up of one part TFE (CAS 116-14-3) and the other half is a polyfluoroether sulfonated material. Everyone of the structures shown have TFE in the bottom section. Teflon is a homopolymer only made of TFE to make PTFE (polytetrafluoroethylene). We have found some of these analytes in the Cape Fear river and in the blood of people that have been drinking the water in Wilmington, NC.

If this is confusing glad to chat more, however here is a PPT of each chemical. Slides 10, 11 and 13 are still an unknown, however the rest are a strong no for PFHxS.

Mark

On Wed, Jan 23, 2019 at 6:24 PM Ruthann Rudel <[rudel@silentspring.org](mailto:rudel@silentspring.org)> wrote:  
Thanks, I hope you get to go back to work soon!

Ruthann Rudel  
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On Fri, Jan 18, 2019 at 5:01 PM Mark Strynar <Ex. 6 Personal Privacy (PP)> wrote:

Ruthann,

I went to our EPA chemicals dashboard (<https://comptox.epa.gov/dashboard>) and had little luck. Most of these are polymers thus the structure is not represented. I can only say NO to one (111173-25-2). When I am back at EPA I have some resources I do not have access to at home to check also.

Mark

70815-05-3, 64346-91-4 , 65104-43-0 unsure cant see structure

111173-25-2 NO

31175-20-9, 65086-49-9, 31176-88-2, 85600-80-2, 69462-70-0, 1163733-25-2, 26654-97-7, 1378930-04-1, 1378928-76-7 unsure cant see structure

On Fri, Jan 18, 2019 at 9:17 AM Ruthann Rudel <[rudel@silentspring.org](mailto:rudel@silentspring.org)> wrote:

Hi Mark,

I guess you're furloughed. I hope you don't mind my sending this to your personal email.

See below.

Thank you and I'm sorry for what you have to go through working for this administration.

-Ruthann

Ruthann Rudel

Director of Research

Silent Spring Institute

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----- Forwarded message -----

From: **Ruthann Rudel** <[rudel@silentspring.org](mailto:rudel@silentspring.org)>

Date: Fri, Jan 18, 2019 at 9:12 AM

Subject: Could any of these chemicals be precursors to PFHxS?

To: Strynar, Mark <[Strynar.Mark@epa.gov](mailto:Strynar.Mark@epa.gov)>

Cc: Katie Boronow <[boronow@silentspring.org](mailto:boronow@silentspring.org)>, Laurel Schaidler <[schaidler@silentspring.org](mailto:schaidler@silentspring.org)>

Hi Mark,

Are you working or furloughed? I hope things are going well, but I realize this must be a difficult time.

We're trying to better understand our observed association between flossing with PTFE floss and serum PFHxS. If you have any information that could inform this question, we'd welcome it.

We found a report from Swedish KEM that lists >130 chemicals in the PTFE group. We are trying to evaluate whether any of them might be precursors of PFHxS. For example here are the ones with "sulfon"

in the name. If you have any thoughts about whether they could be precursors of PFHxS that would be helpful.

Thanks!

Ruthann

70815-05-3	Ethanesulfonic acid, 2-[1-[difluoro[(trifluoroethenyl)oxy]methyl]-1,2,2,2-tetrafluoroethoxy]-1,1,2,2-tetrafluoroethoxy]-
64346-91-4	Ethanesulfonamide, N-(2-aminoethyl)-2-[1-[difluoro[(tetrafluoroethenyl)oxy]methyl]-1,2,2,2-tetrafluoroethoxy]-1,1,2,2-tetrafluoroethoxy]-
65104-43-0	Ethanesulfonamide, N-butyl-2-[1-[difluoro[(trifluoroethenyl)oxy]methyl]-1,2,2,2-tetrafluoroethoxy]-1,1,2,2-tetrafluoroethoxy]-
111173-25-2	Ethanesulfonic acid, 1,1,2,2-tetrafluoro-2-[(trifluoroethenyl)oxy]-, polymer with tetrafluoroethene
31175-20-9	Ethanesulfonic acid, 1,1,2,2-tetrafluoro-2-[1,2,2-trifluoro-2-[(trifluoroethenyl)oxy]-1-(trifluoromethyl)ethoxy]-, polymer with tetrafluoroethene
65086-49-9	Ethanesulfonic acid, 2-[1-[difluoro[(trifluoroethenyl)oxy]methyl]-1,2,2,2-tetrafluoroethoxy]-1,1,2,2-tetrafluoroethoxy]-
31176-88-2	Ethanesulfonic acid, 1,1,2,2-tetrafluoro-2-[1,2,2-trifluoro-2-[(trifluoroethenyl)oxy]-1-(trifluoromethyl)ethoxy]-, polymer with tetrafluoroethene
85600-80-2	Ethanesulfonic acid, 2-[1-[difluoro[(trifluoroethenyl)oxymethyl]-1,2,2,2-tetrafluoroethoxy]-1,1,2,2-tetrafluoroethoxy]-
69462-70-0	Ethanesulfonyl fluoride, 1,1,2,2-tetrafluoro-2-[(1,2,2-trifluoroethenyl)oxy]-, polymer with 1,1,2,2-tetrafluoroethene
1163733-25-2	Ethanesulfonyl fluoride, 1,1,2,2-tetrafluoro-2-[(1,2,2-trifluoroethenyl)oxy]-, polymer with 1,1,2,2-tetrafluoroethene
26654-97-7	Ethanesulfonyl fluoride, 2-[1-[difluoro[(trifluoroethenyl)oxy]methyl]-1,2,2,2-tetrafluoroethoxy]-1,1,2,2-tetrafluoroethoxy]-
1378930-04-1	Ethanesulfonyl fluoride, 2-[1-[difluoro][(1,2,2-trifluoroethenyl)oxy]methyl]-1,2,2,2-tetrafluoroethoxy]-1,1,2,2-tetrafluoroethoxy]-
1378928-76-7	Ethanesulfonyl fluoride, 2-[1-[difluoro][(1,2,2-trifluoroethenyl)oxy]methyl]-1,2,2,2-tetrafluoroethoxy]-1,1,2,2-tetrafluoroethoxy]-

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